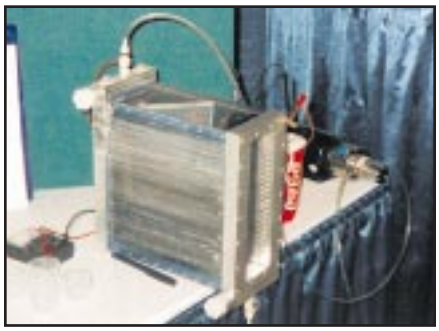
CARBON AEROGEL REALLY CLEANS UP WATER

An energy-efficient water treatment tool that makes salty water safe to drink offers new hope to countries blighted by serious water shortages.



■ This water purification unit (pictured above) contains 1,000 square feet of carbon aerogel surface area, yet occupies only a few cubic feet of space.

■ Using carbon aerogel (pictured above) like a microscopic sponge, capacitive deionization is an efficient, economical process for purifying water.

How about a cool, refreshing cup of seawater? In California, the towns of Santa Barbara and Avalon have begun using desalinization methods to remove the salt from seawater, making it suitable for drinking. Desalination is not used much at the moment because it is too expensive. But as both the demand for fresh water and our population increase, you can expect to see more desalinization occurring, especially in areas such as California and Texas.

Other countries, too, are experiencing serious water shortages. According to an analysis by Population Action International, more than 430 million people—8 percent of the world's population—are living in countries affected by water stress or outright scarcity. For example, China now officially recognizes that 300 of its largest cities are facing water scarcity.

But the world may soon change the way it looks at salty water, thanks to capacitive deionization (CDI) technology recently developed by Lawrence Livermore National Laboratory (Livermore, CA). An energy-efficient and economical process, CDI uses electrochemical cells treated with a unique material to extract salt and other nonorganic contaminants from water. In certain regions of the United States, and in underdeveloped countries around the globe, CDI units could sustain water and ease scarcity.

Frozen smoke. The key to CDI is carbon aerogel, a highly porous material with nanometer-size cells. In the early 1990s, carbon aerogel research at the lab was partially funded by BMDO's space power program to develop lighter batteries. Made of 96 percent air, carbon aerogel appears more like dark frozen smoke than gel. An intriguing characteristic of this material is its large "internal" surface area. If you could flatten out all of the surfaces lining the tiny pores within a sugar-cube-size piece of carbon aerogel, researchers believe the surface would cover five basketball courts. This versatile manmade material promises a wide range of uses, from insulating windows and appliances to extracting salt from seawater.

The Far West Group, Inc. (FWG; Tucson, AZ), a water resources management business, recognized the worldwide potential of CDI for water treatment services. In 1997, the company established a licensing agreement with the lab to commercialize CDI technology. A second license was established to ensure that FWG could manufacture enough carbon aerogel to support its commercial plan.

CDI is better than many of today's desalination options. "CDI systems would consume considerably less energy per unit of purified water than competing technologies, such as thermal distillation or reverse osmosis (RO)," says Jack Reese, FWG's vice president of marketing. "In fact, CDI could eventually replace RO because of greater energy efficiency and lower maintenance costs. And, when the desalinization technology is needed only on a seasonal or periodic basis, CDI has much lower costs than competing technologies because of its indefinite shelf life." Carbon aerogel will store for years without degradation.

Salt bricks. Among the many business opportunities for CDI systems is treating brackish and salty water, providing drinkable water and agricultural-grade water for towns and farms in water-scarce regions. In addition, FWG believes that it could spin off another business that sells the salt it removes from the treatment process. For example, the company is investigating a recent discovery that salt bricks stronger than concrete can be made. Using CDI, semiconductor manufacturers could produce ultrapure water for semiconductor manufacturing. Another application of CDI is extracting harmful contaminants from waste water, which can help industry reclaim heavy metals or hazardous materials from waste streams.

FWG has implemented a multifaceted approach to commercialization. In addition to demonstrating CDI's capabilities in both the United States and abroad, the company is consulting with Boeing Aerospace and Interglobal, Inc., for international distribution. FWG recently succeeded in obtaining $375,000 from Electric and Gas Technology to finance the installation of a proof-of-performance system in Carlsbad, California. Additional funding is being sought to speed development of this technology.

FWG is steadily moving toward a final design. The company has reduced the weight of the original CDI prototype unit by 90 percent and significantly cut manufacturing costs. Looking ahead, it hopes to start building CDI systems in 1999.

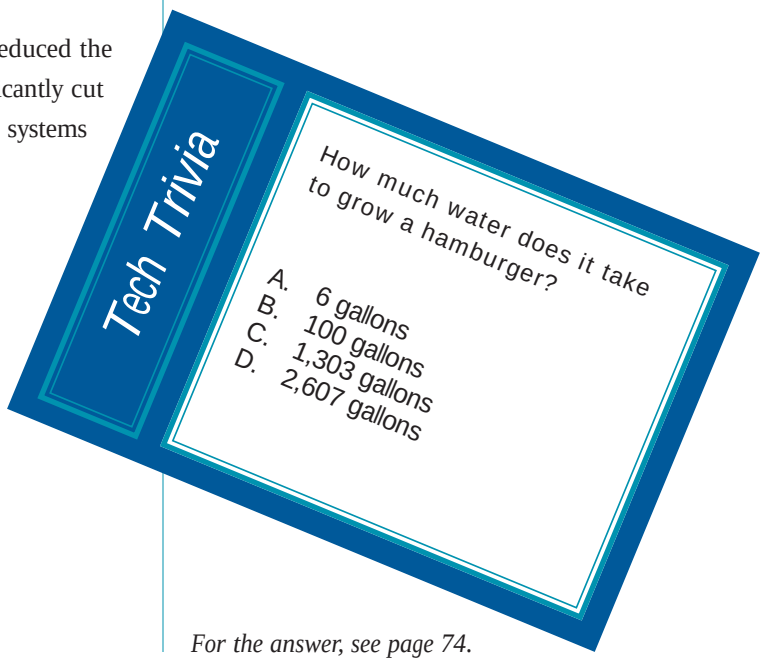
■ For more information, contact Clark Vaught via telephone at (520) 293-9778 or via E-mail at farwest@farwestgroup.com. You can also visit Far West Group's Web site at http://www.farwestgroup.com.

What Does It Mean to You?

With capacitive deionization, you can remove enough salt in brackish and sea water to drink it or use it to sustain farms and lawns.

What Does It Mean to Our Nation?

Capacitive deionization can help water-scarce regions like California and Texas increase freshwater supplies for domestic and agriculture applications, potentially eliminating water-use restrictions.



For the answer, see page 74.